

Potential of a New Granular Rapid Release Elemental S (RRES) Fertilizer in Preventing S Deficiency in Canola on a S-deficient Soil

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Rationale

- Canola is a major cash crop in Parkland region. It has high S requirements because of its high seed protein content.
- As S is immobile in plants, deficiency of S at any growth stage can cause a considerable reduction in seed yield.
- In order to prevent seed yield loss due to S deficiency, a constant supply of available S to plants is thus needed throughout growing season.
- There are a wide variety of commercial fertilizers that contain elemental S (ES), which may cost less per unit of S than sulphate-S fertilizers.
- However, effectiveness of ES fertilizers depends on how quickly ES is oxidized in soil to plant-available sulphate-S.

Objective

- The objective of this study was to determine the relative effectiveness of a new granular rapid release elemental S (RRES, now called Vitasul) fertilizer and sulphate-S fertilizer on seed yield on a S-deficient Gray Luvisol loam soil near Star City, Saskatchewan.

Materials & Methods

- A field experiment was established in the autumn of 2010 on a GrayLuvisol (TypicHaplocryalf) loam soil at Star City, Saskatchewan.
- Soil at this site has shown severe S deficiency in canola in previous years.
- Soil test sulphate-S – 4.5 mg S/kg in 0-15 cm, 2.3 mg S/kg in 15-30 cm and 1.6 mg S/kg in 30-60 cm soil.
- In autumn, all plots were tilled to about 10 cm soil depth, and then granular RRES and potassium sulphate fertilizers were surface broadcast in early-mid October.
- Blanket application of 120 kg N, 30 kg P and 20 kg K/ha to all plots prior to seeding.
- All plots were tilled to incorporate the previously broadcast fertilizers into soil prior to seeding.
- Plots were seeded with a double-disc press drill at 17.8 cm row spacing.

Treatments:

1. Control (no S fertilizer)
2. **RRES** Broadcast Autumn
3. **RRES** Broadcast Spring Pre-Till
4. **RRES** Broadcast Spring Pre-Emergence
5. **RRES** Spring Sideband
6. **RRES** Spring Seedrow-Placed
7. **Potassium Sulphate** Broadcast Autumn
8. **Potassium Sulphate** Broadcast Spring Pre-Till
9. **Potassium Sulphate** Broadcast Spring Pre-Emergence
10. **Potassium Sulphate** Spring Sideband
11. **Potassium Sulphate** Spring Seedrow-Placed

Summary of Results (Figures 1, 2, 3, 4, 5, 6 and 7)

- There was a significant seed yield response of canola to applied S in all 3 years, but the responses varied with S source and with application time-placement combination in different years.
- Seed yield increased considerably with all sulphate-S treatments compared to zero-S control, although seed yield tended to be slightly lower in some spring and/or autumn broadcast treatments than other sulphate-S treatments.
- Compared to the zero-S control, seed yield also increased significantly with all RRES treatments, but the increase was greater with autumn broadcast RRES and/or spring broadcast pre-emergence RRES than other spring applied RRES treatments in many cases.
- On the average of 3 years, there was a significant increase in canola seed yield from applied S compared to zero-S control in all cases, but seed yields varied with S source and/or application time-method combination.
- Seed yield was highest when sulphate-S was broadcast and incorporated into soil prior to seeding in spring. Autumn broadcast RRES and spring pre-emergence broadcast RRES showed potential in preventing S deficiency in hybrid canola, although seed yields were slightly lower (not significantly) than spring broadcast/incorporated sulphate-S.

Conclusions

- Our findings also suggest the potential of autumn broadcast RRES and spring pre-emergence broadcast RRES in preventing S deficiency in hybrid canola, although seed yields were slightly lower than the ideal highest yielding spring broadcast/incorporated sulphate-S treatment.

Acknowledgements

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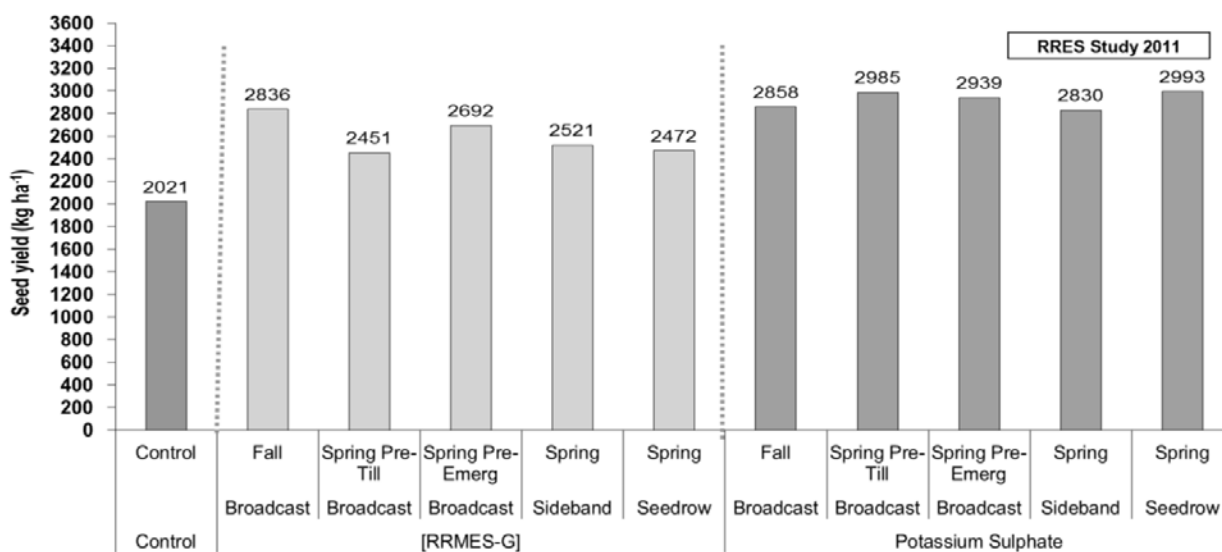


Figure 1. Seed yield of canola with rapid release elemental S (RRES) and sulphate-S fertilizers applied with various combinations of application time and placement method in 2011 on a S-deficient soil at Star City, Saskatchewan ($LSD_{0.05} = 425$).

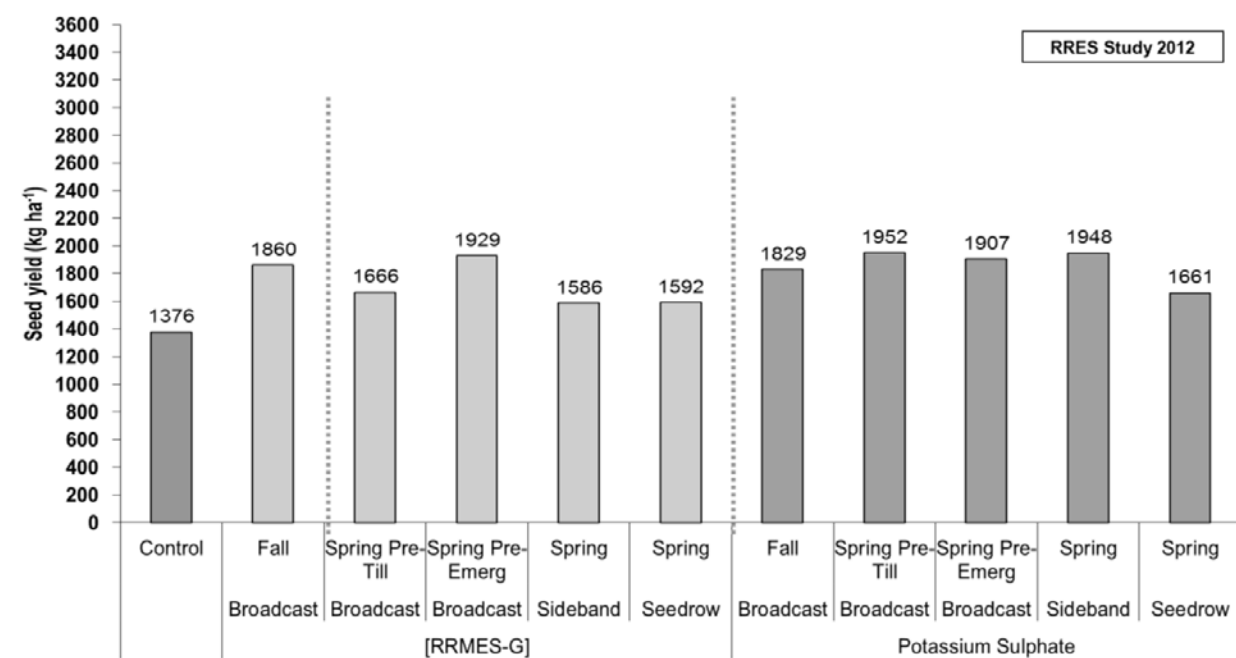


Figure 2. Seed yield of canola with rapid release elemental S (RRES) and sulphate-S fertilizers applied with various combinations of application time and placement method in 2012 on a S-deficient soil at Star City, Saskatchewan ($LSD_{0.05} = 228$).

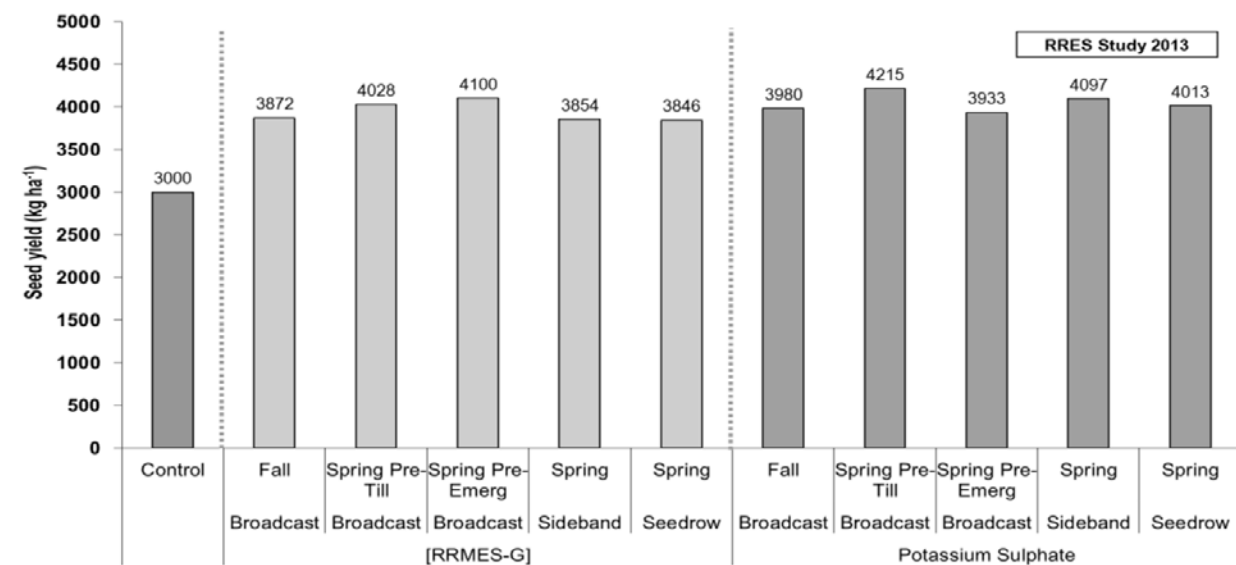


Figure 3. Seed yield of canola with rapid release elemental S (RRES) and sulphate-S fertilizers applied with various combinations of application time and placement method in 2013 on a S-deficient soil at Star City, Saskatchewan ($LSD_{0.05} = 337$).

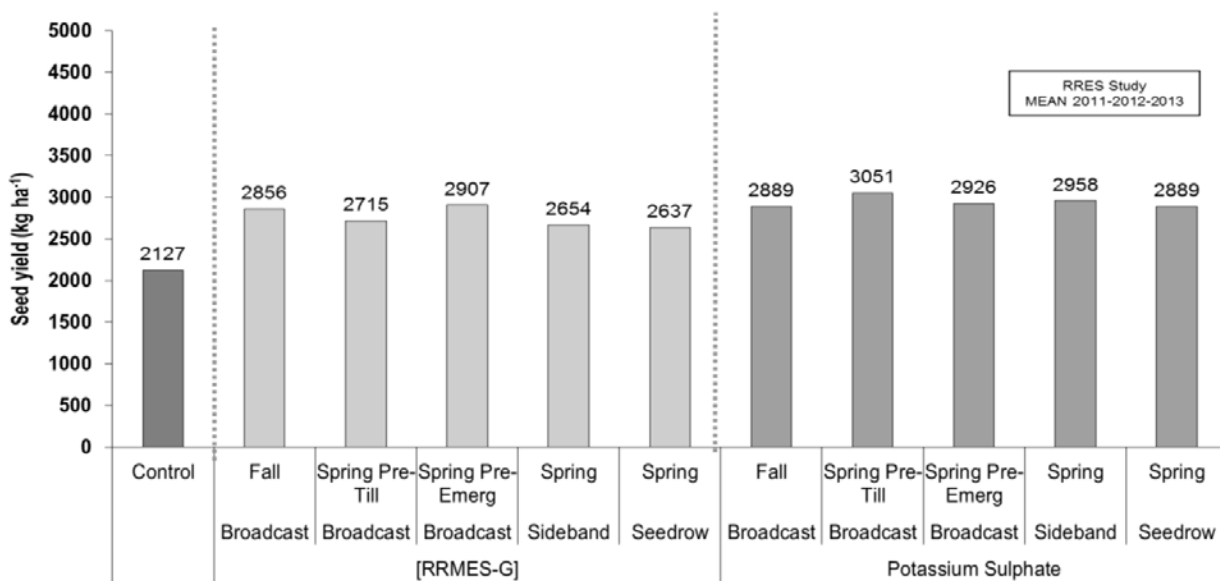


Figure 4. Mean seed yield of canola in 2011-2013 in various S treatments on a S-deficient soil at Star City, Saskatchewan ($LSD_{0.05} = 207$).

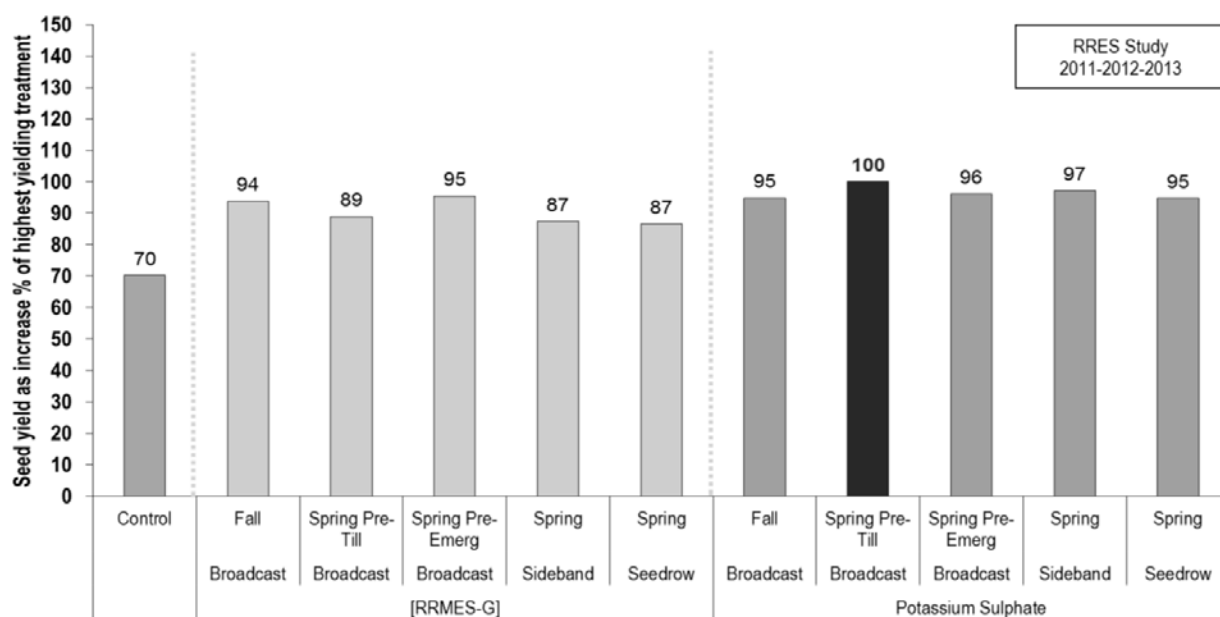


Figure 5. Mean seed yield of canola in 2011-2013 in various S treatments as a percentage of the highest yielding potassium sulphate broadcast pre-till treatment (set at 100%) on a S-deficient soil at Star City, Saskatchewan.

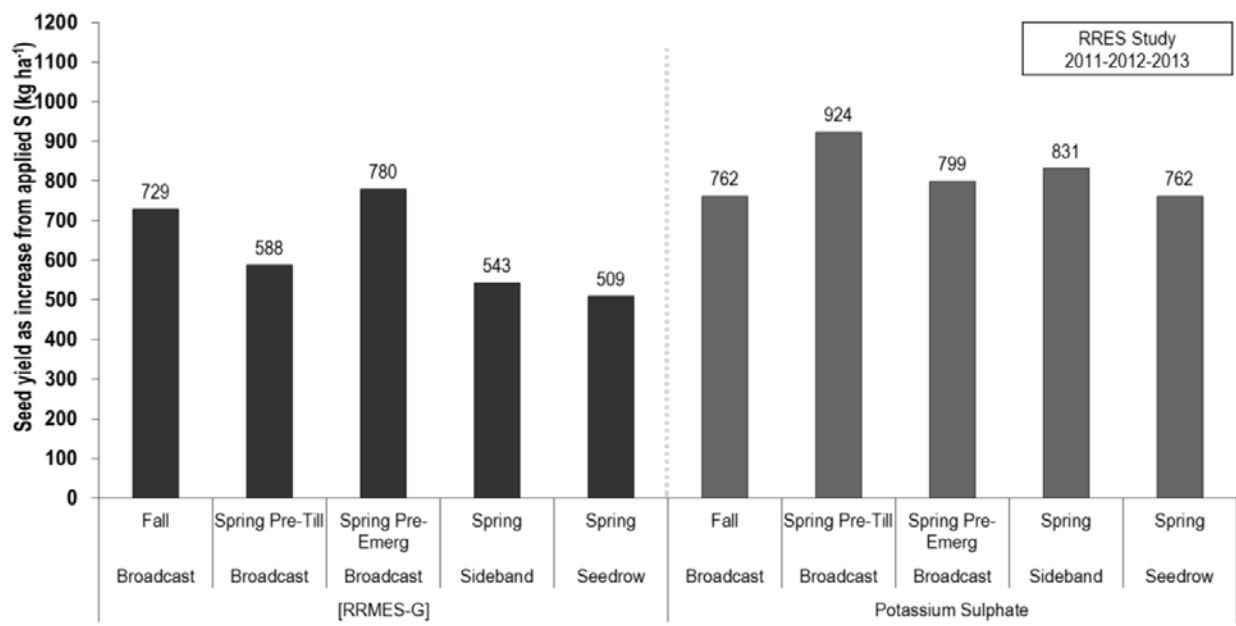


Figure 6. Mean increase in seed yield of canola in 2011-2013 from applied S over control on a S-deficient soil at Star City, Saskatchewan.

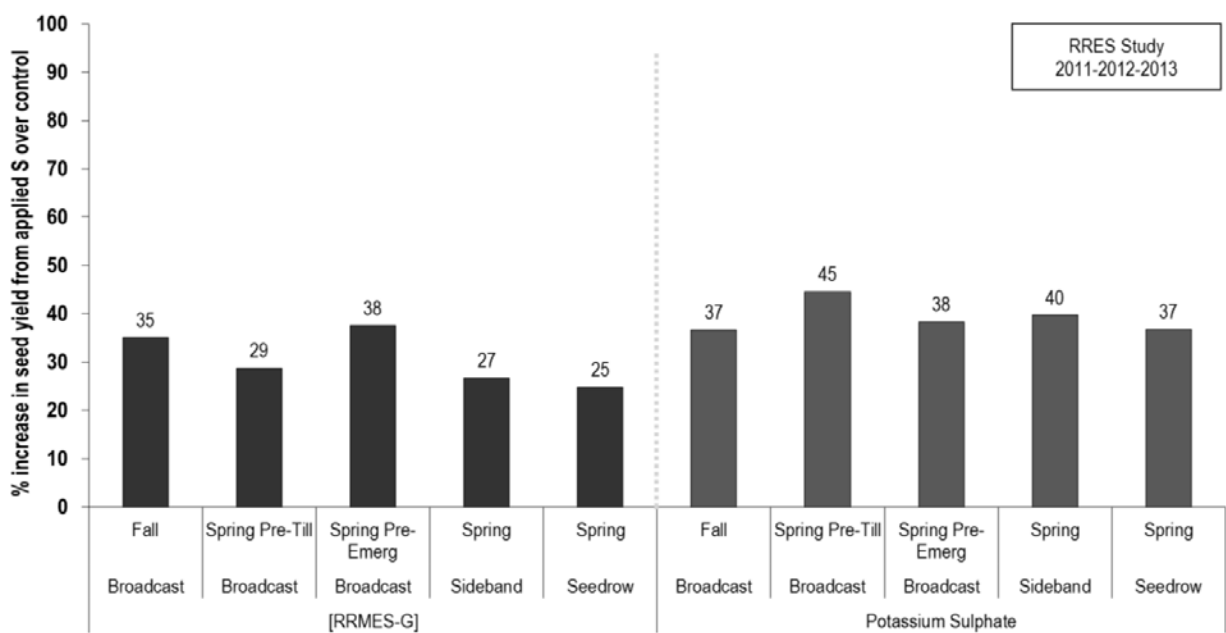


Figure 7. Percent increase in seed yield of canola from applied S over control (average of 3 years – 2011, 2012 and 2013) on a S-deficient soil at Star City, Saskatchewan.